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14. ABSTRACT
We have developed a website on Numerical Modeling of Optical Waveguides (http://optical-waveguides-modeling.net) that contains a Waveguide Tutorial, which summarizes basic concepts of light propagation in optical waveguides, dispersive, and nonlinear properties, and a broad collection of free and commercial software available for numerical simulations of waveguiding structures, supplied with a short summary of its capabilities and potential applications, a list of references to research papers that utilize a particular software package, and a link to the software provider's page. We provide the visitors of our website with an online file-sharing facility to be used to exchange simulation codes, documentation, and other relevant

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Report Title

ARO Final Progress Report

ABSTRACT

We have developed a website on Numerical Modeling of Optical Waveguides (http://optical-waveguides-modeling.net) that contains a Waveguide Tutorial, which summarizes basic concepts of light propagation in optical waveguides, dispersive, and nonlinear properties, and a broad collection of free and commercial software available for numerical simulations of waveguiding structures, supplied with a short summary of its capabilities and potential applications, a list of references to research papers that utilize a particular software package, and a link to the software provider's page. We provide the visitors of our website with an online file-sharing facility to be used to exchange simulation codes, documentation, and other relevant information. This facility is a first step toward building an online research community with its members sharing news, scientific expertise, and knowledge in the field of optical guiding structures modeling. Future plans include creating a discussion group/forum, developing online simulation demos, and expanding this website to review the specifics of numerical modeling of light interaction and propagation in optical metamaterials.

List of papers submitted or published that acknowledge ARO support during this reporting period. List the papers, including journal references, in the following categories:

(a) Papers published in peer-reviewed journals (N/A for none)

Number of Papers published in peer-reviewed journals: 0.00

(b) Papers published in non-peer-reviewed journals or in conference proceedings (N/A for none)

Number of Papers published in non peer-reviewed journals: 0.00

(c) Presentations

Number of Presentations: 0.00

Non Peer-Reviewed Conference Proceeding publications (other than abstracts):

Number of Non Peer-Reviewed Conference Proceeding publications (other than abstracts): 0

Peer-Reviewed Conference Proceeding publications (other than abstracts):

Number of Peer-Reviewed Conference Proceeding publications (other than abstracts): 0

(d) Manuscripts

Number of Manuscripts: 0.00

Number of Inventions:

Graduate Students

NAME	PERCENT_SUPPORTED
FTE Equivalent:	
Total Number:	

Names of Post Doctorates

NAME	PERCENT_SUPPORTED
FTE Equivalent:	
Total Number:	

Names of Faculty Supported

NAME	PERCENT_SUPPORTED	National Academy Member
Natalia Litchinitser	0.15	No
FTE Equivalent:	**0.15**	
Total Number:	**1**	

Names of Under Graduate students supported

NAME	PERCENT_SUPPORTED
FTE Equivalent:	
Total Number:	

Student Metrics

This section only applies to graduating undergraduates supported by this agreement in this reporting period

The number of undergraduates funded by this agreement who graduated during this period:	0.00
The number of undergraduates funded by this agreement who graduated during this period with a degree in science, mathematics, engineering, or technology fields:.....	0.00
The number of undergraduates funded by your agreement who graduated during this period and will continue to pursue a graduate or Ph.D. degree in science, mathematics, engineering, or technology fields:.....	0.00
Number of graduating undergraduates who achieved a 3.5 GPA to 4.0 (4.0 max scale):	0.00
Number of graduating undergraduates funded by a DoD funded Center of Excellence grant for Education, Research and Engineering:	0.00
The number of undergraduates funded by your agreement who graduated during this period and intend to work for the Department of Defense	0.00
The number of undergraduates funded by your agreement who graduated during this period and will receive scholarships or fellowships for further studies in science, mathematics, engineering or technology fields:	0.00

Names of Personnel receiving masters degrees

NAME
Total Number:

Names of personnel receiving PHDs

NAME
Total Number:

Names of other research staff

NAME	PERCENT_SUPPORTED
FTE Equivalent:	
Total Number:	

Sub Contractors (DD882)

Inventions (DD882)

ARO Final Progress Report
Electromagnetic Wave Propagation in Optical Guiding Structures: Numerical Modeling

Principal Investigator: N. M. Litchinitser
Web Designer: V. Z. Iakhnine

1. Objective

The goal of this project was to build a website containing a comprehensive review of the methods and available software for the numerical analysis of electromagnetic wave propagation in guiding structures.

2. Summary

We have developed a website on Numerical Modeling of Optical Waveguides (http://optical-waveguides-modeling.net) that contains a Waveguide Tutorial, which summarizes basic concepts of light propagation in optical waveguides, dispersive, and nonlinear properties, and a broad collection of free and commercial software available for numerical simulations of waveguiding structures, supplied with a short summary of its capabilities and potential applications, a list of references to research papers that utilize a particular software package, and a link to the software provider's page. We provide the visitors of our website with an online file-sharing facility to be used to exchange simulation codes, documentation, and other relevant information. This facility is a first step toward building an online research community with its members sharing news, scientific expertise, and knowledge in the field of optical guiding structures modeling. Future plans include creating a discussion group/forum, developing online simulation demos, and expanding this website to review the specifics of numerical modeling of light interaction and propagation in optical metamaterials.

3. Website Structure Overview

The website contains the following pages: Home (front page), Waveguide Tutorial, Numerical Methods, Bibliography, Site Map, Community, and Search. Figure 1 shows a snapshot of the front page.

The front page contains a “Welcome” message and a brief introduction to the website structure. It also includes a “News” section with announcements of the upcoming research meetings, workshops, and conferences related to numerical modeling of optical waveguides and other aspects of guided waves optics.

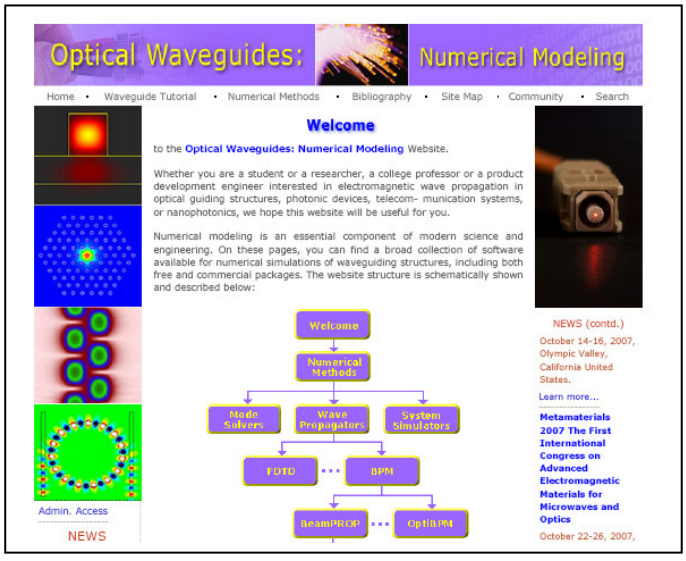

Figure 1. A snapshot of the front page.

The Numerical Methods page is a key part of the website. It contains an extensive collection of software packages for various types of optical waveguide simulations, including mode solving, linear and nonlinear wave propagation, and applications such as fiber-optic communication systems and

photonic devices. The structure and contents of this page will be discussed in the next section.

For users who are new to the field of guided wave optics, we offer a short Waveguide Tutorial, which summarizes basic concepts of light propagation in optical waveguides, including waveguide modes, dispersive, and nonlinear properties.

In addition, we compiled a Bibliography that contains many useful references about various aspects of guided waves optics and its applications, including Optical Waveguides and Fibers, Waveguide Modeling, Photonic Devices, Photonic Crystal Fibers and Periodic Structures, Nonlinear Guided Waves, Fiber Transmission Systems, and other general references.

The website is also supplied with a Site Map for easier navigation through the site, a "community" section, providing an online file-sharing facility to be used to exchange simulation codes, documentation, and other relevant information, as well as a search engine, enabling visitors to explore the site with the keywords of their choice. We encourage visitors to send us their comments and suggestions, as we believe that the site has potential for growth and improvement.

4. Numerical Methods

The structure of the Numerical Methods part of the website, containing a broad collection of numerical tools for optical waveguide modeling is schematically shown in Fig. 2.

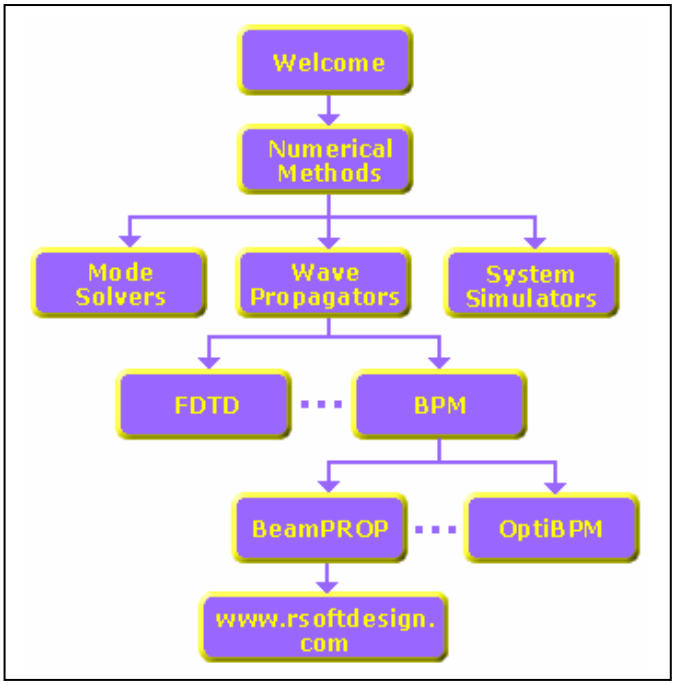

Figure 2. Schematic of the Numerical Methods sections of the website.

The software is divided into three major categories: Mode Solvers, Wave Propagators, and System Simulators. Each category contains an introduction and a list of numerical methods used to solve problems in this category. Figure 3 shows the Wave Propagators page as an example.

Each method is supplied with a brief description, references for further reading, and a list of software packages that employ a particular method as illustrated in Figures 4 and 5. Some software packages can be used as Mode Solvers and Wave Propagators simultaneously and, therefore, are accessible from both categories.

Each software package is supplied with a short summary of its capabilities and potential applications, a list of references to research papers that utilize a particular software package (if available), and a link to the software provider's page. A typical example is shown in Figure 6.

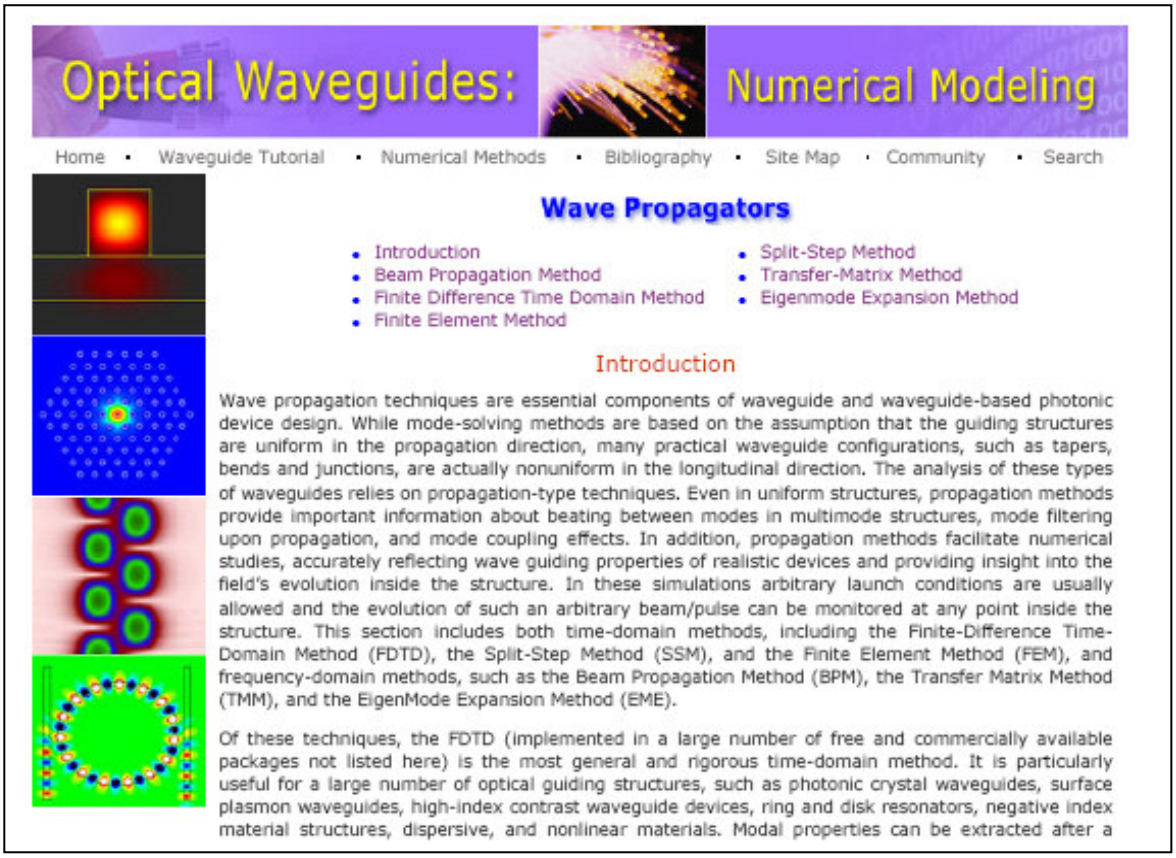

Figure 3. An example of introductory page structure under the Numerical Methods category.

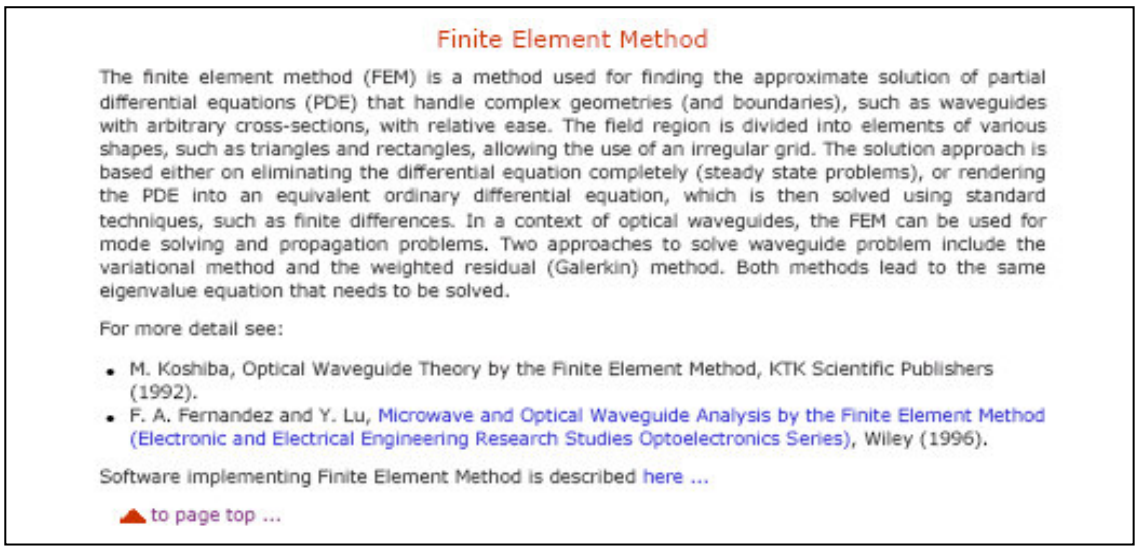

Figure 4. A snapshot of the Finite Element Method as an example of a method description page.

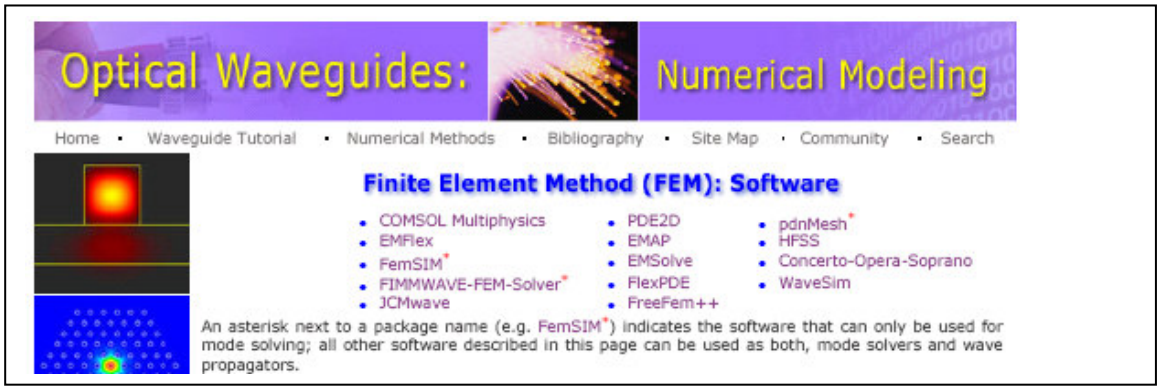

Figure 5. A list of software based on the Finite Element Method. An asterisk next to a package name (e.g., FemSIM*) indicates software that can only be used for mode solving; all other software can be used as both mode solvers and wave propagators.

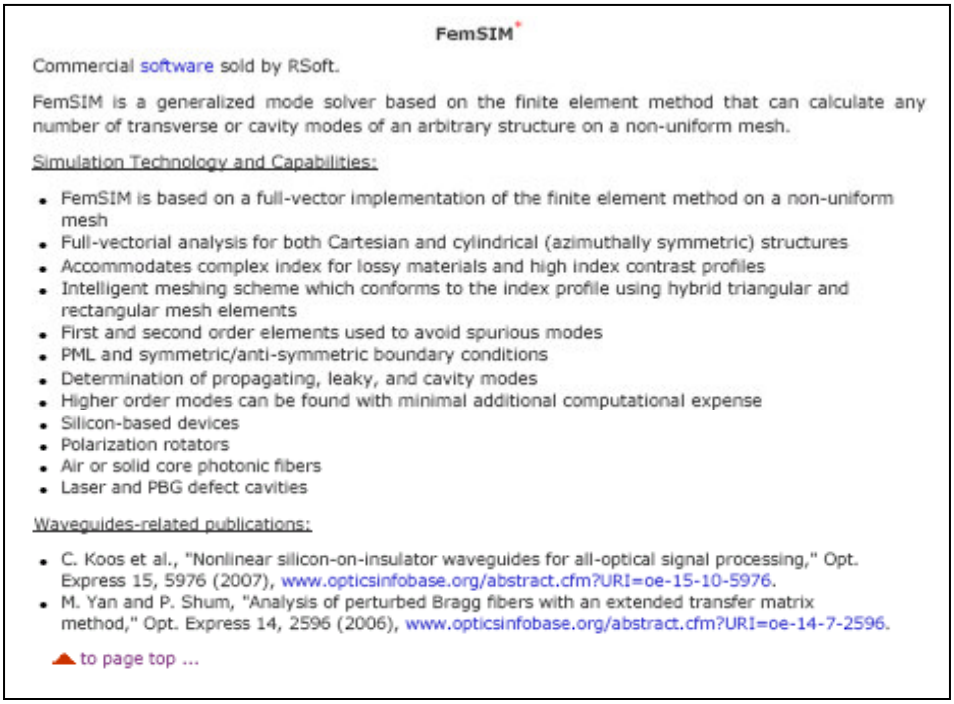

Figure 6. A snapshot of a short description of the FemSIM software package.

Other Features

There are several useful features available for the visitors and users of the website, including website navigation tools and a file-share system, allowing the upload and download of numerical codes and other related documents. Navigation tools include a dynamic menu at the top of the page, a simple menu at the bottom of the page, a Site Map (illustrated in Fig. 7), and

a Search engine. The Site Map provides a straightforward access to all website resources and gives the most comprehensive overview of the site.

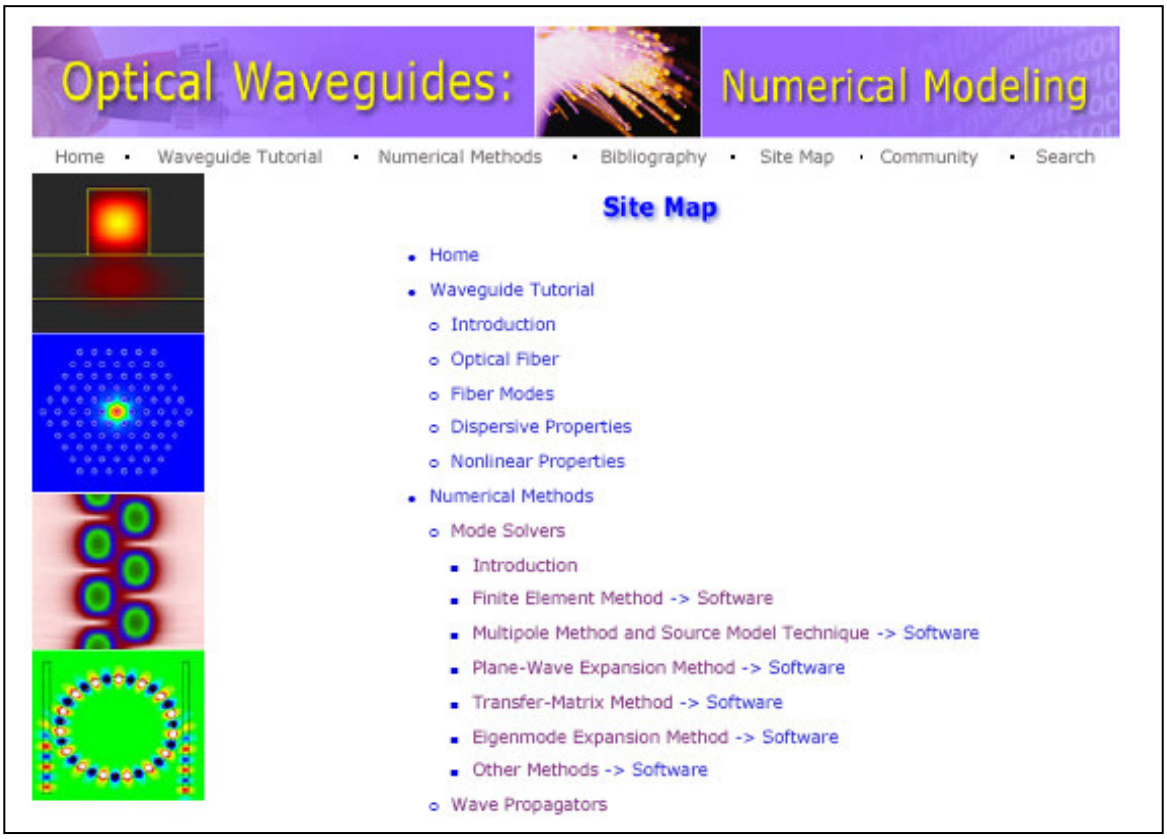

Figure 7. A snapshot of the Site Map page.

We hope that our website will be useful for the broad community of scientists, engineers, and industrial users working in the field of guided wave optics, photonic devices, telecommunication systems and nanophotonics, as well as university professors and students in their course work. We look forward to developing an online community, assisted by this site, with its members sharing news, scientific expertise, and enthusiasm, potentially leading to new scientific collaborations nationally and internationally.